In the Fall 2002 term, along with colleague Elaine Simmt, we co-instructed a doctoral seminar in the Department of Secondary Education at the University of Alberta—EDSE 608, *Cognition and Curriculum*. In the outline, we described the course as follows:

The main purposes of this seminar are to review recent philosophical, theoretical, and empirical research into human cognition and to situate such work against the particular concerns of educators and educational researchers.

As a backdrop to these discussions, the course will begin with brief reviews of two earlier “moments” in theorizing about cognition. The first of these might be described as oriented by an analytic (from the Greek *analuein*, “to break down”) attitude. Philosophy and research in this moment tended to be framed by ancient and uninterrogated cultural assumptions on the absolute and reducible nature of knowledge. Work oriented by this attitude is often characterized by rather severe distinctions between mental and physical, thought and action, internal and external, individual and collective, knowing subject and known object, rationalist and empiricist, and so on.

The second moment in cognitive theory that we will consider was prompted by a rejection of some of these “Cartesian dualisms.” Originally informed by phenomenological, psychoanalytic, and pragmatist philosophies—and later spurred by postmodernist, poststructuralist, and various critical perspectives—these discourses worked to problematize the sorts of the dyads listed in the preceding paragraph.
Although certainly not true of all these discourses from the second moment, a tendency among them has been an ignorance (often deliberate) of the biological bases of knowing and knowledge. This matter has moved to center-stage with recent advances in brain imaging and genetic engineering technologies. As well, research in ecology and in the complexity sciences has contributed to an expansion of the notion of cognition, as the phenomenon has now been stretched across processes that range from the subcellular to the planetary. The bulk of the course will be devoted to the study of these emergent discourses and their significances for matters of teaching and curriculum.

Included among the readings were summary accounts of the development of Cartesian rationalism, the influence of Darwin on philosophy, the rise of structuralist and poststructuralist discourses, and the emergence of ecology and complexity science—all of which were framed by the intertwining questions: What counts as knowledge? How do people come to know? and, What are curriculum and teaching imagined to be?

The principal texts in the course were Francisco Varela’s (1999) Ethical know-how: Action, wisdom, and cognition, parts of Fritjof Capra’s (2002) The hidden connections: Integrating the biological, cognitive, and social dimensions of life into a science of sustainability, and parts of Engaging minds: Learning and teaching in a complex world that we co-authored with Rebecca Luce-Kapler (2000). In all three of these texts, poststructuralist, phenomenological, and ecological discourses are integrated with recent research in neurosciences, evolutionary biology, and the complexity sciences. We overlapped and interlaced these readings with one another and with ongoing interpretive writing assignments, some aspects of which can be discerned in the articles that are linked to this one.

As co-instructors, we decided before we began that the course would be at least in part structured around a project for which everyone involved would share responsibility. We weren’t actually sure what that project might be, but we felt a useful exercise to help us think through the possibilities was to assemble a glossary of key vocabulary as the course evolved. The final version of the glossary was 12 pages of single-spaced text in 9-point font that included more than 100 terms. The glossary’s entries—which ranged from ancient Greek mythos to current neurophenomenology—were identified as we went along. Every two or three weeks, we generated a new version in which previous meanings were elaborated, new entries were included, and potential new entries were identified—the past reconfigured by the present, giving shape to an imagined future.

Almost immediately the structure of the glossary proved to be a little troublesome. With the first iteration, it became clear that the organizational
strategy of alphabetization wasn’t going to be very useful to us. It was almost as though the glossary was actively resisting such an arrangement. Since our uses of the terms in the actual seminars tended to be clustered around different worldviews and sensibilities, in the second iteration of the glossary, entries were arranged according to the era and the mindset in which they seemed to be embedded and from which they seemed to emerge.

In the processes of clustering the terms and of juxtaposing the clusters, an interesting thing happened. As a collective, we started to attend more on the deep similarities of the various traditions than on the superficial differences among their vocabularies. Our attentions came to be focused less on reasonable definitions and more on the histories of the ideas—specifically, on those moments at which shifts or differences in opinion contributed to the emergences of very different ways about thinking about knowledge, learning, and teaching. Put differently, we found ourselves assembling a genealogy of popular answers to the question, What counts as knowing?

The artifact at the center of this writing, our genealogical tree of contemporary conceptions of teaching is one of the results. It is an attempt to trace some of the origins, evolutions, and entanglements of the terms that we use to talk about teaching, and it is organized around the moments at which and the reasons for which once-figurative notions froze into literalness.

Following Foucault, we understand a genealogy to be a critical interpretive practice that is intended to untangle some of the ways in which discourses constitute the objects, practices, and/or subjects that are available for study. Unlike a history, which is popularly understood to be a linearized chronological narrative of events that are seen to have precipitated a specific outcome, a genealogy is a trace of several strands of happenings as they pull away from and sometimes re-entangle with one another and as they give rise to a proliferation of possibilities. Hence, whereas histories most often obey the image of a (time)line, the image that is most commonly associated with a genealogy is a tree.

When the notion of genealogy is applied to a cluster of ideas—like, for instance, contemporary conceptions of teaching—certain accommodations are required. For example, unlike biological ancestry, concepts do not emerge through successive generations. Critical moments in their evolutions can occur at any time, with whole new branches of thought growing out of old roots or dormant stumps. Hence, the emergence of a cluster of ideas can’t usefully be interpreted or represented in terms of any sort of chronology. But the branching image of a tree is still useful, provided it is organized around key theoretical developments and not chronological events.
It is for this reason that this genealogy starts in the middle of the 19th century with Darwin, not in the first millennium BCE with the beginnings of formal Western philosophy. Darwin offered a new way of thinking about the universe. He proposed a dramatic break from the model of the cosmos that had been assumed at least since Pythagoras and Plato. The influence of Darwin’s ideas on contemporary thinking about learning and teaching has been nothing short of revolutionary. What Darwin did was to propose physical explanations for the diversity of forms that are observed and the transitions that those forms undergo. His theories were offered in place of the metaphysical accounts that had been entrenched for millennia, and which in fact prompted the emergence of the very scientific enterprise that supported Darwin’s work.

Up until Darwin, scientific research consisted mainly in efforts to map out the faultlines of the cosmos—that is, to identify how forms in this universe are and always were distinct from one another. The results were extensive taxonomies—systems to parse up the universe. Darwin introduced a new way of thinking. Rather than focusing on current differences, he looked back in time to historical emergences. Few others had thought to do, since it was assumed that the forms that were observed were the forms that always were. Darwin’s new way of thinking involved attending to the common origins of such things and the conditions that prompted their divergences from one another.

His theory did more than interrupt entrenched metaphysical assumptions. It challenged what it meant to do science. The dichotomizing attitude championed by the ancient Greeks and maintained by Descartes and Bacon did not suit phenomena whose forms were always changing. Science moved from the quest for dichotomies toward the examination of bifurcations—or, in terms of narrative structures, from histories to genealogies—or, mathematically speaking, from Euclid’s geometry of points and lines to fractal geometry’s trees, webs, and endless detail (Davis & Sumara, 2000).

Over the last century or so, in various forms, theories that are rooted in evolutionary thought have taken hold in educational research. Included among these are constructivist, constructionist, critical, sociocultural, poststructuralist, and ecological discourses. Let us try to map out some of the current and historical influence of evolutionary theory by pointing to the histories of a handful of contemporary terms for the cultural phenomenon of teaching.

The roots of many current synonyms for teaching reach far back into history and extend into many ways of thinking about what counts as knowing. However, even as the assumptions and cultural conditions that frame teaching have been subject to continuous and dramatic evolutions,
vocabularies have tended to linger. A result is that current discussions of teaching tend to be framed by terms that have never been completely dissociated from the webs of assumption from which they were originally drawn.

We’re going to offer a truncated genealogy of the following terms: educating, nurturing, indoctrinating, inducting, disciplining, instructing, enlightening, training, conditioning, facilitating, modeling, mentoring, enculturating, empowering, emancipating, participating, occasioning, conversing, and caring. (A more detailed version of this genealogy is available in Davis, forthcoming.)

We’ll begin with a map of what we’re up to. This discussion is structured around a small number of key branching points in Western thinking. Specifically, the discussion is developed around breaks in opinion that gave or that are giving rise to diverse interpretations of knowledge, learning, and teaching.

In what follows, we offer brief descriptions of the branching points, as illustrated on the tree image. Unfortunately, we are constrained by a linear discussion of a nonlinear form, and so these notes are organized as a series of traces from the trunk to the outer branches starting from the left-most part of the image and moving to the right. (Again, this discussion has been rather severely abbreviated. An elaborated version in available in Davis, forthcoming.)

THE METAPHYSICAL
We begin by looking at those words that arose in metaphysical traditions around the assumptions that the truth is out there and that learning is mainly a matter of getting something from the outside to someplace inside of oneself.

THE METAPHYSICAL > GNOSIS
Assumptions of the separation of mental and physical are pervasive across ancient Western mystical, religious, and analytic philosophical
traditions. With this notion firmly in place, it is not surprising that those who focused on questions of spiritual knowledge and deep meaning—what the ancient Greeks called *gnosis*—would see teaching in terms of the soul.

**THE METAPHYSICAL > GNOSIS > MYSTICISM**
Those caught up in mysticist traditions tended to focus on the individual, and they cast teaching as *educing* or *educating*—literally, as “pulling out” or “drawing forth” the knowledgeable self and that was seen as a monad locked in a biological prison. Such work was often associated with mothering; hence the emergence of terms such as *nurturing*, “suckling.”

**THE METAPHYSICAL > GNOSIS > RELIGION**
Those teachers who were oriented by religious institutions understood their efforts in terms of pulling people into established orders rather than drawing people out of themselves. Their vocabularies for teaching made this point explicit: *inducting* (“drawing in”), *disciplining* (understood in terms of enforcing habits of action and interpretation), and so on.

**THE METAPHYSICAL > EPISTEME**
The complement of *gnosis*, spiritual knowledge, in the cosmology of the ancient Greeks, was *episteme*, everyday know-how. Episteme was unconcerned with matters of wisdom or questions of why things are. Its realm was how things worked, and it began with the fact that what is, is.

**THE METAPHYSICAL > EPISTEME > RATIONALISM**
With Descartes, this starting place—with what is, rather than with why what is, is—was institutionalized as the first principle in an unshakeable edifice of knowledge (i.e., his *cogito*). Those who followed his lines of thought began to think of teaching as *instructing*—literally, as imposing structure to enable the learner to organize and assemble a rational and coherent internal model of the external world, one that was illuminated by reason.

**THE METAPHYSICAL > EPISTEME > EMPIRICISM**
Those who followed Francis Bacon’s empiricism, by contrast, became obsessed by the power of experimental science and would extend their obsessions with measurement and their cause•effect logic to a teaching that was all about *training* and *conditioning*. Consistent with the empiricist’s dream of observerless observations and measurerless measurements, teaching also came to be associated with examining.

These all make sense—but they only make sense when the learner is seen in terms of an incomplete being, something striving for an unrealizable wholeness. And when what counts as knowing is something that’s out
there that needs to be taken in.

THE PHYSICAL
But a totally different way of thinking emerges if learning is imagined to be a reaching out rather than a taking in. This is a shift that was triggered by Darwin, along with the likes of Rousseau and Vico, who proposed that learning is all about an endless tinkering that’s made necessary by the fact that learner and context are dynamic and co-implicated. In terms of what counts as knowing, through the 20th century the frame of discussions shifted from the metaphysical belief that the truth is out there to the physically rooted belief that truth keeps happening.

THE PHYSICAL > INTERSUBJECTIVITY
This conceptual move introduced a new problem: What is knowledge, if not some other-worldly form that is mined and possessed? The response of theorists was the development of the notion of intersubjectivity—that truth was a matter of collective accord, not objective reality. At the turn of 20th century, the idea was embraced and elaborated by such discourses as pragmatism, phenomenology, and psychoanalysis.

THE PHYSICAL > INTERSUBJECTIVITY > STRUCTURALISM
One of the immediate elaborations of the notion of intersubjectivity was the idea that truths and meanings weren’t about references to an external reality, but about coherences with one another. Truth, that is, wasn’t rooted in indubitable and rigorous fact, but in viable and consistent interpretation. This structuralist idea was first applied to phenomena like language (in the work of de Saussure) and mathematics (in the work of the collective known as Bourbaki). By the mid-20th century, it had been applied to personal cognition (by Piaget), interpersonal activity (by Vygotsky), and all domains of knowledge (by Popper, Kuhn, and others). In the hands of psychologists, sociologists, and educational researchers, structuralist insights morphed into constructivisms and social constructionisms. From them come conceptions of teaching as facilitating, modeling, and mentoring.

THE PHYSICAL > INTERSUBJECTIVITY > POSTSTRUCTURALISMS
Poststructuralist discourses are elaborations of structuralist discourses. They add the important point that meaning and truth are not just about coherences, but about deferrals. Poststructuralist discourses ask us to attend to the unsaid and the unsayable—what has become transparent and must remain transparent in order for particular worldviews to be maintained. For educators, a central point of poststructuralist discourses is that unjust, constraining, and pervasive structures are knitted into popular conceptions of ‘the way things are.’ For them,
teaching is most often about *enculturating*, but a teaching that is conscious of its own conditions can be about *empowerment* and *emancipating*.

**THE PHYSICAL > INTEROBJECTIVITY**

Structuralisms and poststructuralisms are focused on language and human interpretation. At about the same time that discussions of knowledge within the arts and humanities were shifting toward notions of intersubjectivity, there was a movement within the sciences toward notions of interobjectivity. Among scientists, current discussions of the natures of scientific inquiry and scientific fact are coming to be oriented by a realization that the cultural project of knowledge-making must be understood in terms of the complicity of the researcher in knitting the fabric of relations through which knowledge claims are rendered sensible and significant. In brief, the suggestion is that there are no observerless observations or measurerless measurements. Science is seen to be not just a matter of intersubjective agreement, but of the mutually affective relationship between phenomena and knowledge of phenomena—that is, of interobjectivity.

**THE PHYSICAL > INTEROBJECTIVITY > COMPLEXITY SCIENCE**

Several different strands of inquiry, oriented by interobjectivist sensibilities, arose through the 20th century—including cybernetics, information theory, systems theory, and non-linear dynamics. Towards the end of the century, these and other movements coalesced into ‘complexity science,’ the study of adaptive, self-organizing systems. Complexity science is interested in unities that live and learn—and those unities include not just individual humans, but various collectives (classroom groupings, student bodies, bodies of knowledge, and so on), some subpersonal phenomena (immune systems, brain regions, and so on), and some supercultural forms (species, the biosphere, and so on). In brief, all of these phenomena arise in the co-specifying activities of similarly complex agents, and this realization points to a whole new conception of teaching—as *participating* in the unfolding of the collective, as *occasioning* the emergence of more complex possibilities, of expanding the sphere of the possible and moving into the spaces that open up.

**THE PHYSICAL > INTEROBJECTIVITY > ECOSYSTEM**

Unfortunately, for the most part, the dispassionate tones of empiricist science have tended to be maintained within complexity science. Although new realms of discursive possibility have been opened, they tend not to be engaged in terms of ethical obligation—as evidenced by the fact that these discourses have been readily and prominently embraced by big business. Ecological discourses, in contrast, foreground the ethical imperative to behave well. These discourses are
also rooted in the ideas of emergence and evolution. For them, teaching comes to be about engaging mindfully in the unending processes of bringing forth possible worlds. To the ecologist, teaching must be attentive and tentative, aware that it is caught up in an unfolding conversation of what is. In educational and curriculum studies, this idea has also been represented in terms such as caring and pedagogical thoughtfulness.

These notions of bringing forth possible worlds, of immediate coping, of micro-worlds are all developed by Varela (1999) in his book, *Ethical know-how*. Ethics, for Varela, are not principles inscribed in the universe that can be rationally derived, they are not instinctive, they are not strictly the artifacts of culture or a necessary mechanism for our living together. Ethical action, rather, is action that is appropriate here, now. It can’t be divined or imposed, it can’t be derived or discovered. It merely is—or isn’t.

Provocatively, this manner of thinking seems to ‘wrap around’ to some of the sensibilities that are present in ancient mystical traditions. Common ground includes, for example, the assumed interconnectedness of the cosmos, the need for close attendance to the emergence of possibilities, and the insistence on ethical action. There are also profound differences, however. Complex and ecological modes of thinking do not advocate a return to past ways. Rather, they are new manners of interpretation that foreground some important, ancient, and currently marginalized intuitions, even while they provide critique of the metaphysical roots of those intuitions.

**References**


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